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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/786,559	03/02/2001	Venkata Adisheshaiah Bhagavatula		3542

7590
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05/22/2003

EXAMINER

SUCHECKI, KRYSZYNA

ART UNIT	PAPER NUMBER
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2882

DATE MAILED: 05/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/786,559

Applicant(s)

BHAGAVATULA ET AL.

Examiner

Krystyna Suchecki

Art Unit

2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on _____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 and 22-29 is/are pending in the application.
- 4a) Of the above claim(s) 15-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 10-14, 26 and 27 is/are rejected.
- 7) ☒ Claim(s) 7-9, 22-25, 28 and 29 is/are objected to.
- 8) ☒ Claim(s) 1-29 are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 March 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☒ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-14 and 22-29, drawn to a single mode optical waveguide having a radial and azimuthal asymmetric core, classified in class 385, subclass 123.
 - II. Claims 15-21, drawn to methods for making fiber waveguides, classified in class 65, subclass 412.
 - III. Claims 22-29, drawn to a multimode optical waveguide having a radial and azimuthal asymmetric core, classified in class 385, subclass 123.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I and III are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the invention of group two can be used to make two products, either the invention of group I or the invention of group III.
3. Inventions I and III are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions utilize single or multimode light.

Art Unit: 2882

4. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

5. During a telephone conversation with Joseph Homa on 05/14/03 a provisional election was made with traverse to prosecute the invention of group I, claims 1-14 and 22-29.

Affirmation of this election must be made by applicant in replying to this Office action. Claims 15-21 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Specification

7. The disclosure is objected to because of the following informalities: Multiple errors appear as follows:

- a. Page 6, lines 4 and 10 and Page 7, lines 9 and 25: AA' and BB' are not in the drawings;
- b. Page 6, line 16: reference should be made to Fig. 1G, not 1c;
- c. Page 7, line 20 should reference "shrunk", not "shrink";
- d. Page 7, line 22 should reference Figure 2C;
- e. Page 7, line 29 is grammatically incorrect;

Art Unit: 2882

- f. Page 8, lines 5-6, 10 and 13 should reference Figures 2E, and 2F as appropriate.

Appropriate correction is required.

Drawings

8. The drawings are objected to because lines connecting numerals to their associated elements do not align in Figure 1G. Also, item 86 of Figure 2F is not in the specification. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

9. Claims 7 and 22 are objected to because of the following informalities: the functions $f(r)$ and $g(r)$ are vague and indefinite. Appropriate correction is required.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 1-7 and 10-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Brehm (US 4,978,377).

12. Regarding Claim 1, Figure 12 and Column 5 of Brehm teach a single mode optical waveguide fiber having a radial and azimuthal asymmetric core comprising: a core region in contact with a surrounding clad layer (outer tube 14), at least a portion of the core region having a refractive index which is greater than the refractive index of at least a portion of the clad layer

Art Unit: 2882

(lines 31-38); the waveguide having a centerline parallel to the long dimension of the waveguide, and the waveguide having at least one core sector bounded by a first and a second plane, and a segment of the core region periphery intersected by the first and the second plane, wherein the first and second planes each contain the centerline and form at the centerline an included angle $\phi < 180^\circ$, in which, the core refractive index changes along at least a portion, Δr , of a pre-selected radius extending perpendicular to and outward from the centerline, and, the core refractive index at least at a point at a pre-selected radius inside the at least one core sector has a value different from the core refractive index value at least at a point at the pre-selected radius outside the at least one core sector.

13. Regarding Claim 2, Figure 12 of Brehm teaches the single mode waveguide of claim 1, in which, the core region has a cylindrical shape and a point in the core region has cylindrical coordinates, radius r , azimuth angle ϕ , and centerline height z , and the radius of the core region is $r = r_0$, and the pre-selected portion of the radius is in the range $0 < \Delta r \leq r_0$.

14. Regarding Claim 3, Figure 12 of Brehm teaches the single mode waveguide of claim 2, in which, the pre-selected portion of the radius is the segment $\Delta r = r_2 - r_1$, where, $0 \leq r_1 < r_2$ and $r_2 < r_0$.

15. Regarding Claim 4, Figure 12 of Brehm teaches the single mode waveguide of either claim 2 or claim 3 in which the pre-selected portion of the radius lies along any radius in at least one sector having included angle $0 < \phi \leq 180^\circ$.

16. Regarding Claim 5, Figure 12 of Brehm teaches the single mode waveguide of claim 2, in which, the pre-selected portion of the radius Δr is in the range $0 < \Delta r < r_0$, the azimuth

Art Unit: 2882

angle of the radius is in the range $0 < \phi \leq 360^\circ$, and the radius is drawn from any point z along the centerline.

17. Regarding Claim 6, Figure 12 of Brehm teaches the single mode waveguide of claim 2, in which, the pre-selected portion of the radius is the segment $\Delta r = r_2 - r_1$ and $r_2 \leq r_0$, the azimuth angle of the radius containing the segment is in the range $0 \leq \phi \leq 360^\circ$, and the radius containing the segment is drawn from any point z along the centerline.

18. Regarding Claim 7, Figure 12 of Brehm teaches the single mode waveguide of claim 2, in which, the core has 4 sectors of equal volume numbered consecutively from 1 to 4 in a counter-clockwise azimuth direction, and the boundary planes of each sector have an included angle of 90° , and sectors 1 and 3 have a radial change in refractive index defined by a function $f(r)$, and sectors 2 and 4 have a radial change in refractive index defined by a function $g(r)$.

19. Regarding Claim 10, Column 5 of Brehm teaches the single mode waveguide of claim 2, in which the core has three sectors, and each sector comprises a volume of a first glass of constant refractive index embedded in a volume of a second glass of constant refractive index, in which the refractive index of the first glass is greater than the refractive index of the second glass.

20. Regarding Claim 11, Figure 12 of Brehm teaches the single mode waveguide of claim 10 in which each of the first glass volumes is an elongated body having its long axis aligned parallel to the centerline, wherein the perpendicular cross section of the elongated body is selected from the group consisting of a circle, an ellipse, and a parallelogram.

21. Regarding Claim 12, Figure 12 of Brehm teaches the single mode waveguide of claim 2, in which the core has three sectors, and each sector contains an elongated glass volume (11 or

Art Unit: 2882

12) having a central portion (See column 5 and Figures 10B and 11B), a first annular portion surrounding and in contact with the central portion, and at least one additional annular portion (51) in contact with the annular portion which the at least one additional annular portion surrounds, wherein the long axis of each of the elongated structures is parallel to the centerline.

22. Regarding Claim 13, Column 5 of Brehm teaches the single mode waveguide of claim 12 in which the central portion is a cylinder having radius r_c and relative index Δc , and the annular regions are tubes having respective outer radii r_i and relative index Δi where $i = 1 \dots n$, and n is the number of annular portions, in which Δi for $i =$ an even number is greater than Δi for i equal to an odd number.

23. Regarding Claim 14, Figure 12 of Brehm teaches the single mode waveguide of claim 2 in which the core has four sectors each sector comprising a first glass volume having relative index $\Delta 1$, and embedded in the first glass volume of each sector is an elongated volume of a second glass having relative index $\Delta 2$, wherein the respective elongated volumes are arranged symmetrically about the centerline.

24. Claims 26 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Kompfner (US 3,823,996).

25. Regarding Claim 26, Figures 2-4 of Kompfner teaches a multimode optical waveguide fiber having a radial and azimuthal asymmetric core comprising: a core region in contact with a surrounding clad layer (22), at least a portion of the core region having a refractive index which is greater than the refractive index of at least a portion of the clad layer (Figure 4); the waveguide having a centerline parallel to the long dimension of the waveguide, and the waveguide having

Art Unit: 2882

four core sectors each bounded by a first and a second plane, and a segment of the core region periphery intersected by the first and the second plane, wherein the first and second planes each contain the centerline and form at the centerline an included angle $\phi \leq 180^\circ$, wherein, the core region is of cylindrical shape and a point in the core region has cylindrical coordinates, radius r , azimuth angle ϕ , and centerline height z , and the radius of the core region is $r = r_o$, and the refractive index changes along a radius portion Δr in the range $0 < \Delta r < r_o$ wherein, the core has three sectors, and each sector comprises a volume of a first glass of constant refractive index embedded in a volume of a second glass of constant refractive index, in which the refractive index of the first glass is greater than the refractive index of the second glass (Figure 2).

26. Regarding Claim 27, Kompfner teaches the waveguide of claim 26 in which each of the first glass volumes is an elongated body having its long axis aligned parallel to the centerline, wherein the perpendicular cross section of the elongated body is selected from the group consisting of a circle, an ellipse, and a parallelogram (Figure 2).

Allowable Subject Matter

27. Claims 8-9 and 28-29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

28. Claims 22-25 would be allowable if 22 was rewritten to overcome the objection above.

29. The following is an examiner's statement of reasons for allowance: Claim 8 is allowable for at least the reason that prior art fails to teach or suggest the use of both step index and alpha-profile functions for radial changes with a single core element as in the claimed combination.

Art Unit: 2882

Claim 9 is allowable for at least the reason that prior art fails to teach or suggest a single mode waveguide as claimed having three annular regions with first and second volumes embedded so that they are bounded by the three annular regions as in the claimed combination. Claims 22-25 are allowable for at least the reason that the multimode combination involving the use of four sectors that have duplicity of refractive index radial change occurrence is not taught in the prior art. Claims 28-29 are allowable for at least the reason that prior art fails to teach or suggest the use of annular portions as claimed in the multimode combination.

30. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

31. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Patent to Morse (US 6,115,526) is of interest for teaching a multimode waveguide with radially and azimuthally varying sections, but Morse fails to teach that opposed sections have duplicate radial changes in refractive indexes. Patent to Imoto (US 5,712,941) is of interest for teaching multiple annular regions surrounding a central portion, with a multiplicity of such regions and portions within one waveguide structure. Imoto also teaches various types of regions with portions, but Imoto fails to teach or suggest the use of the various types of regions in combination with one another within one waveguide structure. Patent to Morgenthaler (US 3,811,941) is of interest for teaching an azimuthally varied waveguide with diagonally opposed sectors that are not of the same material. Morgenthaler does not teach the repetition of a type of

Art Unit: 2882


material within a waveguide structure, however. Patent to Hussey (EP 0 227 366 A2) is of interest for teaching an azimuthally and radially varying waveguide, but fails to teach four sectors having at least two different types of refractive index variation. Patent to Bassett (WO 89/11109) is of interest for teaching an azimuthally and radially varying fibre, but does not teach four sectors having at least two different types of refractive index variation.

32. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krystyna Suchecki whose telephone number is (703) 305-5424. The examiner can normally be reached on M-F 8-6, with alternating Fridays off.

33. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (703) 305-3492. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

34. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4900.

ks
May 15, 2003


ROBERT H. KIM
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